

WHAT IS CLAIMED IS:

1. A tilt servo control device of an information recording/reproducing apparatus for recording information on and reproducing information from an optical recording medium, said apparatus comprising an optical system for leading a laser beam emitted from a light source to a recording surface of the optical recording medium and a laser beam reflected by the recording surface of the recording medium to a split type photo detector and a read signal generator for generating a read signal in accordance with an output signal of the photo detector, said device comprising:

a push-pull component generator for generating a push-pull component signal including a differential component of output signals of respective split portions of said photo detector;

a tilt error signal generator for generating a tilt error signal representing a tilt angle between a normal to the recording surface of said optical recording medium at a position of said laser beam irradiating the recording surface and an optical axis of said laser beam based on said push-pull component signal;

a tilt angle adjuster for adjusting said tilt angle;  
and

a driver for driving said tilt angle adjuster so as to reduce said tilt error signal.

2. A tilt servo control device according to claim 1, wherein

said photo detector has a main light receiving section which is divided into at least two portions and two sub light receiving sections between which said main light receiving section is inserted, which are respectively divided into two portions, each of said main light receiving section and said sub light receiving sections being arranged so that the divided line thereof is parallel with a tangential direction of a track of said optical recording medium, and generating an output signal for each divided portion;

said apparatus comprising:

a main push-pull signal generator for generating a main push-pull signal representing the differential component of the output signals of said main light receiving section;

a sub push-pull generator for generating first and second sub push-pull signals representing the differential components of the output signals of said two sub light receiving sections; and

an adder for adding said first and second sub push-pull signals and multiplying the sum of the addition by a predetermined coefficient to generate a sub push-pull sum signal;

wherein said push-pull component signal is one of a main/sub push-pull sum signal obtained by adding said main push-pull signal and said sub push-pull sum signal, said main push-pull signal and said sub push-pull sum signal.

3. A tilt servo control device according to claim 1, further comprising a holder for holding, as a reference

signal, a signal obtained by smoothing said push-pull component signal corresponding to said read signal showing a desired level at a predetermined area of said optical recording medium;

wherein said tilt error signal generator generates a tilt error signal in accordance with the difference between said signal obtained by smoothing said push-pull component signal and said reference signal.

4. A tilt servo control device according to claim 3, further comprising a setting device for setting a recording power level of the laser beam output from said light source by carrying out a tentative writing operation in a power calibration area before an actual information recording operation after being holding said reference signal by said holder.

5. A tilt servo control device according to claim 3, wherein said predetermined area of said optical recording medium is an embossed area, a pre-write area or a power calibration area having a pit formed by a tentative writing operation.

6. A tilt servo control device according to claim 5, wherein said predetermined area is the embossed area when said optical recording medium is a DVD-RW.

7. A tilt servo control device according to claim 5, wherein said predetermined area is the pre-write area when said optical recording medium is a general purpose DVD-R.

8. A tilt servo control device according to claim 5,

wherein said predetermined area is the power calibration area when said optical recording medium is an authoring purpose DVD-R.

9. A tilt servo control device according to claim 3, wherein said read signal is controlled to show a desired level by means of offset regulation of a focusing servo system and the drive against said tilt angle adjuster by said driver.

10. A tilt servo control device according to claim 1, wherein said tilt angle adjuster includes a liquid crystal panel having a plurality of regions arranged in said optical system, and

said driver drives each of said plurality of regions of said liquid crystal panel in accordance with said tilt error signal.

11. A tilt servo control device according to claim 3, wherein said tilt error signal generator includes a subtracter for computing a difference between said push-pull component signal and said reference signal.

12. A tilt servo control method of an information recording/reproducing apparatus for recording information on and reproducing information from an optical recording medium, said apparatus comprising an optical system for leading a laser beam emitted from a light source to a recording surface of the optical recording medium and a laser beam reflected by the recording surface of the recording medium to a split type photo detector and a read signal generator for generating a

read signal in accordance with an output signal of the photo detector, said method comprising the steps of:

generating a push-pull component signal including a differential component of output signals of respective split portions of said photo detector;

generating a tilt error signal representing a tilt angle between a normal to the recording surface of said optical recording medium at a position of said laser beam irradiating the recording surface and an optical axis of said laser beam based on said push-pull component signal; and

driving a tilt angle adjuster for adjusting said tilt angle so as to reduce said tilt error signal.